

TITLE

**METHOD FOR REDUCING A STANDBY PERIOD OF TIME FOR
PRINTING**

CLAIM OF PRIORITY

This application makes reference to, incorporates the same herein, and claims all benefits accruing under 35 U.S.C. §119 from the inventor's application *METHOD FOR REDUCING A STANDBY PERIOD OF TIME FOR PRINTING* filed with the Korean Industrial Property Office on 20 May 1999 and there duly assigned Serial No. 18172/1999.

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates, in general, to a method and system for reducing standby time for printers. More specifically, the invention concerns a method and system for reducing standby time for printing in a set of networked printers.

Description of the Related Art

As known to those skilled in the art, a network is a communication structure in which two or more communication apparatuses are interconnected for the purpose of data communication and serves to transmit data between interconnected apparatuses. In this

1 structure, transmitting and switching apparatuses as well as computers are interconnected by
2 a communication line. Networks include the Internet, Local Area Networks (LANs) and
3 Wide Area Networks (WANs). The Internet is a network in which networks are
4 interconnected all over the world. LAN is a network in which communication apparatuses
5 are interconnected in a local area. A WAN is a network in which communication
6 apparatuses are interconnected in a wide area.

7 As computer networking technology developed and services using the technology
increased, the operating systems for computers progressed to Network Operating System
(NOS) and Distributed Operating System (DOS).

8 A printer is an apparatus that receives print data from data transmitting apparatuses
9 such as personal computers and prints the print data in the form of a document. Printers
10 include network printers and computer-connected printers. The former has a network card
11 for allowing network communication to be possible.

12 When two or more network printers and at least one host computer are connected to
13 a network, the user of the host computer may select one of the network printers and utilizes
14 the selected network printer for a print operation. When a print operation is required to be
15 performed for the host computer, print data are transmitted from the host computer to the
16 selected network printer. The selected network printer performs the print operation using the
17 print data that are transmitted from the host computer.
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1 When there are a large amount of print operations in the selected network printer
2 that received the print data, the selected network printer detects the network printer of the
3 same type among the other network printers and relays the print data received from the
4 host computer. The detected network printer performs the print operation using the print
5 data that are transmitted from the host computer.

6 Exemplars of the art are Gase *et al.* U.S. Patent No. 5,580,177 entitled
7 *PRINTER/CLIENT NETWORK WITH CENTRALLY UPDATED PRINTER DRIVERS*
8 *AND PRINTER STATUS MONITORING*; Lobiondo U.S. Patent No. 5,287,194 entitled
9 *DISTRIBUTED PRINTING*; Nardozzi U.S. Patent No. 5,179,637 entitled *METHOD AND*
10 *APPARATUS FOR DISTRIBUTING PRINT JOBS AMONG A NETWORK OF IMAGE*
11 *PROCESSORS AND PRINT ENGINES*; Sasaki U.S. Patent No. 5,228,118 entitled
12 *PRINTING SYSTEM WHEREIN ONE OF PRINTER DRIVERS THROUGH WHICH*
13 *PRINT DATA IS SENT FROM A DATA PROCESSOR TO A PRINTER IS SELECTED*
14 *BASED ON INTERPRETERS AVAILABLE ON THE PRINTER*; and Akabori *et al.* U.S.
15 Patent No. 5,940,582 entitled *DATA PRINTING SYSTEM AND METHOD, AND A*
16 *CONTROLLER AND PRINTER THEREFOR.*

17 The art has failed, however, to combine the instantaneous backlog of work
18 distributed among network computers and to prioritize the assignment of forthcoming
19 printing jobs on the basis of net distribution. Consequently, since a print operation must

1 be performed in a network printer selected by a host computer in which the print
2 operation is required to be performed even though one or more network printers are
3 connected to a network, a standby period of time is lengthy when a large amount of print
4 operations are in the selected network printer. Additionally, when a print operation is
5 performed in such a way that a selected network printer relays print data to another
6 network printer and the latter network printer performs the print operation using the print
7 data, the efficiency and applicability of print operation suffers because only a network
printer of the same type can be selected for this case.

SUMMARY OF THE INVENTION

10 ~~Accordingly, the present invention is directed to solving the above problems~~
11 occurring in the prior art. An object of the present invention is to provide a method and
12 system, which is capable of reducing a standby period of time for printing. According
13 to the present invention, when a host computer detects the amount of print operations in
14 every networked one of a plurality of printers, it transmits print data to a network printer
15 that has no pending print operation or else has the least amount of print operations, and
16 causes the network printer to print the print data.

17 The present invention involves the steps of registering at least one item of network
18 print information in the host computer; detecting the network printer information
19 registered in the host computer if a command for printing has been selected; transmitting

Preferably, the registration step comprises the steps of determining whether the command for registering network printer information in the host computer has been selected, detecting network printers connected to the network if the command for registering network printer information in the host computer has been selected, and storing the network printer information in a memory of the host computer.

Preferably, the method further comprises the steps of assigning priority numbers to the network printer information in detected order, and storing assigned priority numbers together with the network printer information in the memory.

Preferably, the network printer information includes at least an Internet protocol address of the registered network printer.

preferably, the network printer information includes at least an Internet protocol address of the registered network printer.

preferably, the network print detecting step comprises the steps of detecting

1 ~~priority numbers that have been assigned to the network printers having the least amount~~
2 of standby print operations if the number of the network printers having the least amount
3 of standby print operations is two or more, and detecting a network printer having a
4 preferential priority number.

5 BRIEF DESCRIPTION OF THE DRAWINGS

6 A more complete appreciation of the invention, and many of the attendant
advantages, thereof, will be readily apparent as the same becomes better understood by
reference to the following detailed description when considered in conjunction with the
accompanying drawings in which like reference symbols indicate the same or similar
components.

Fig. 1 is a schematic diagram in which the connection among a plurality of host
computers and network printers is illustrated.

Fig. 2 is a block diagram showing the constructions of a host computer and a
network printer in detail.

Fig. 3 is a flowchart showing a procedure for registering network printer
information in the host computer.

7 ~~Fig. 4 is a flowchart showing a procedure for reducing standby time in accordance~~
8 ~~with the present invention.~~

1 Fig. 5 is a lookup table illustrating the network printer information registered in
2 the host computer in accordance with the procedure of Fig. 3.

3 ~~DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS~~

4 In the following, a preferred embodiment of the present invention is described in
5 detail with reference to the accompanying drawings.

6 Fig. 1 is a schematic diagram in which the connection among a plurality of host
computers and network printers is illustrated. Fig. 2 is a block diagram showing the
constructions of a host computer and a network printer in detail. Fig. 3 is a flowchart
showing a procedure for registering network printer information in the host computer.
Fig. 4 is a flowchart explaining a standby time period reducing method in accordance
with the present invention. Fig. 5 is a lookup table illustrating the network printer
information registered in the host computer in accordance with the procedure of Fig. 3.

13 First of all, the connection among a plurality of host computers and network
14 printers and the constructions of a computer and a network printer are described.

15 As illustrated in Fig. 1, at least one host computer 1 and two or more network
16 printers 2 are connected to a network 3.

17 ~~The construction of the host computer 1 is described first.~~

18 Referring to Fig. 2, a control unit 10 of host computer 1 controls the entire host

1 computer. In particular, control unit 10 controls the network printer information of the
2 network printers 2 connected to network 3 to be registered in a memory 11 (described
3 below). Control unit 10 evaluates the information concerning the amounts of standby
4 print operations that are received from the network printers connected to network 3, and
5 causes the print data of host computer 1 to be finally transmitted to the proper network
6 printer.

7 Memory 11 stores various programs and data processed according to the control
of control unit 10 of host computer 1. In particular, the network printer information of
network printers 2 that is connected to network 3 is registered in memory 11. Application
program 12 is a program that is capable of making out various documents.

Print manager 13 is a program that displays various states concerning the print
operation so that a user can control the print operation.

Printer driver 14 is a program that converts print data prepared in application
program 12 to the data suitable for network printer 2 and transmits the converted data to
network printer 2.

Interface 15 is a port for connecting host computer 1 to network 3. Interface 14
serves to transmit the data converted in printer driver 13 to network printer 2, and to input
the network printer information and information concerning the amount of standby print
operations received from one or more network printers to host computer 1.

Control unit 20 of network printer 2 controls the entire network printer. In particular, control unit 20 controls the information concerning the amount of standby print operations to be transmitted to host computer 1 in response to the request of the host computer 1.

Memory 21 stores various control programs required for realizing the functions of network printers 2 and data generated in the process of performing the programs, and in particular, print data that have been received from host computer 1.

Operation panel 22 comprises a plurality of keys and a display. Operation panel 22 serves to input key data, which are generated when the keys are pressed, to control unit 20 and to display the operating status of network printer 2 in accordance with the display data of control unit 20.

Engine controller 23 actuates a printer engine (described below), and transmits the print data stored in memory 21 to the printer engine, in accordance with the control of control unit 20 of network printer 2.

Printer engine 24 serves to perform the print operation using the print data transmitted from engine controller 23.

Interface 25 is a port for connecting network printer 2 to network 3. Interface 25 serves to receive print data from host computer 1 and transmit the network printer information and the information concerning the amount of standby print operations to

1 host computer 1.

2 With reference to Figs. 3 and 5, a standby time period reducing method of the
3 present invention is described as follows.

4 First, a procedure for registering network printer information in the host computer
5 is described with reference to Fig. 3. In order to register the information of one or more
6 network printers connected to network 3 in host computer 1, a user selects a command
7 for registering network printer information in the host computer 1, on a print operation
window that is provided by printer driver 14.

Control unit 10 of host computer 1 determines whether the user has selected the
command for registering network printer information in the host computer 1 (S301), and
detects network printers 2 connected to network 3 (S302) if the command for registering
network printer information has been selected.

Thereafter, if at least one network printer 2 connected to the network 3 is detected,
control unit 10 of host computer 1 controls the information of the detected network
printers to be registered in host computer 1 by storing the network printer information
(for example, the type of the network printer, the port of the network printer, the Internet
Protocol (IP) address of the network printer, etc.) one by one in memory 11. In such a
case, control unit 10 assigns priority numbers to the network printer information in
detected order (S303) and stores the network printer information, to which priority

1 numbers are assigned, in memory 11 (S304).

2 After network printers 2 are registered in host computer 1, host computer 1 is
3 capable of printing the print data via network printer 2 that permits no standby time
4 period or a shortest standby time period to the print operation. This is described with
5 reference to Fig. 4.

6 First, control unit 10 of host computer 1 determines whether the user has selected
7 a command for printing the print data by means of network printer 2 connected to
network 3 (S401).

8 ~~If the command for printing has been selected, control unit 10 detects Internet~~
9 ~~Protocol (IP) addresses among one or more items of network printer information stored~~
10 ~~in memory 11 and transmits to the detected IP addresses a command for requesting~~
11 ~~network printers 2 to transmit the information concerning the amount of standby print~~
12 ~~operations (S402).~~

13 Each of control units 20 of network printers 2 corresponding to the IP addresses
14 determines whether the command for requesting network printers 2 to transmit the
15 information concerning the amount of standby print operations has been received (S403).
16 If the command for requesting network printers 2 to transmit the information concerning
17 the amount of standby print operations has been received, control unit 20 detects
18 information concerning the amount of standby print operations, that is, the size of print
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1 data stored in memory 21 while not being printed and transmits the information
2 concerning the amount of the standby print operations to host computer 1 (S404).

3 Control unit 10 of host computer 1 determines whether the information concerning
4 the amount of the standby print operations has been received via interface 15 from at least
5 one host computer 1 connected to network 3 (S405). If the information concerning the
6 amount of the standby print operations has been received, control unit 10 evaluates the
7 information concerning the amount of the standby print operations (S406). Control unit
10 determines whether there exists network printer 2 having no print operation, that is,
no standby print data (S407). If there exists network printer 2 having no print operation,
control unit 10 transmits print data to the corresponding network printer (S408). At this
time, if the number of the network printers having no print operation is two or more,
control unit 10 detects priority numbers that have been assigned in STEP S304 and
transmits print data to a network printer having a preferential priority number. If network
14 printer 2 having no print operation does not exist (NO in STEP S407), control unit 10
15 detects the network printer having the least amount of standby print operations among the
16 network printers having standby print operations (S409).

17 Thereafter, control unit 10 of host computer 1 causes the detected network printer
18 to perform the print operation. Therefore, the print data is transmitted to the network
19 printer that permits a shortest standby time period to the print operation, thereby reducing

1 the standby period for printing.

2 Although the preferred embodiments of the present invention have been disclosed
3 for illustrative purposes, those skilled in the art will appreciate that various modifications,
4 additions and substitutions are possible, without departing from the scope and spirit of
5 the invention as disclosed in the accompanying claims.